SECTION 32 8400

PLANTING IRRIGATION

****

LANL MASTER SPECIFICATION

When editing to suit project, author shall add job-specific requirements and delete only those portions that in no way apply to the activity (e.g., a component that does not apply). To seek a variance from applicable requirements, contact the ESM Civil POC.

When assembling a specification package, include applicable specifications from all Divisions, especially Division 1, General Requirements.

Delete information within “stars” during editing.

Specification developed for ML-3 projects. For ML-1 / ML-2, additional requirements and QA reviews are required.

****

PART 1 GENERAL

1.1 SECTION INCLUDES

A. Underground sprinkler system.

B. The Work consists of providing an underground irrigation system as shown and specified, including the furnishing of labor, equipment, appliances, and materials and in performing operations in connection therewith, including but not limited to piping, valves, backflow preventer, heads, drains, controllers, and other components, accessories and appurtenances required for a complete, operable system. Perform trenching, excavation, boring, backfilling and compacting required.

1.2 SUBMITTALS

A. Submit the following in accordance with the requirements of Section 01 3300, Submittal Procedures:

1. Catalog data for all equipment furnished under this Section.

2. Installation instructions for underground sprinkler system.

3. Operating and maintenance manual.

   a. Prepare a zone chart for each controller with waterproof, color-coded diagram keying stations of the controller to valve locations and to the irrigation heads served by the station. Diagram is to be mounted inside the door of the automatic controller. Copy to be included in the Operation and Maintenance Manual.

4. Record Drawing: Prepare and make corrections as required by LANL. On a record print mark the exact arrangement of the irrigation system, including the location of valves and main lines. Show locations by a system of measurements from easily identified, permanent features such as building, roads and walks.

1.3 QUALITY ASSURANCE

A. All irrigation work shall be performed by a single firm specializing in irrigation work. Work shall be performed by a licensed Irrigation Contractor experienced with the type and scale of work required and having the equipment and personnel adequate to perform the work satisfactorily.

B. Provide underground sprinkler system in as complete a unit as possible, produced by a single manufacturer, including heads, valves, piping circuits, controls, and accessories.

1.4 STORAGE AND HANDLING

A. Follow manufacturer's recommended procedures in loading, unloading, stacking, transporting and handling all materials to be used.

1.5 JOB CONDITIONS

A. Prior to installing irrigation heads, stake or otherwise locate trees and shrub areas according to plans, or as adjusted in field under LANL's direction. Coordinate bubblers and shrub pop-ups with tree and shrub locations. Do not lay irrigation lines in rootball zones of plants. Coordinate the work of constructing the irrigation system with the planting schedule.

PART 2 PRODUCTS

2.1 PLASTIC PIPE AND FITTINGS

A. Pressure Lines: Schedule 40 or Schedule 80 PVC pipe, ASTM D 1785, as shown on Drawings.

B. PVC Fittings: Schedule 40, ASTM D 2466; Schedule 80, ASTM D 2467.

C. Nipples: 3/4 inch and 1 inch, Schedule 80, PVC, threaded.

2.2 CLEANER, PRIMER AND SOLVENT CEMENTS

A. Use compatible cleaner, primer, and solvent cements. Comply with the requirements of ASTM D 2855.

2.3 SPRINKLER HEADS

A. Install as shown on the Drawings. The irrigation design is based on the characteristics of the following standard heads:

Toro Company:

Large Radius Head	Model No. 640
Medium Radius Head	Model No. 700 super
Small Lawn Pop-up	Model No. 570-4P
Shrub Pop-up	Model No. 570-HP
Bubblers for Shrub Areas	Model No. 500 series
Bubblers - Adjustable	Model No. 514-20

2.4 DRIP EMITTERS

A. Provide fittings and drip tubing compatible with drip emitters. Provide solvent welded or compression type fittings between drip system and PVC irrigation system.

2.5 VALVES

A. Provide automatic valves (type and size) as indicated on Drawings. Valves shall have a manual bleed screw in the handle and bleed ports protected with built in filter. Valves shall be made of noncorrosive material. The valve shall open and close smoothly with low pressure loss. The valve shall be installable at any angle and have a flow control and manual shut off. The solenoid shall be 24 volts A.C.60 Hz and have a consumption not exceeding 2 watts. Manufacturer: Toro Inc., Model 216.

B. Provide manual gate valve, Type 1, rated at 250 lbs. water pressure, threaded ends, meeting MSS-SP-80, Bronze Gate, Globe, Angle and Check Valves Specification.

2.6 QUICK COUPLER VALVES

A. Provide quick coupler valves as indicated on the Drawings. Provide coupler keys, swivel ells, and hose bibs in the quantity of one for each quick coupler.

2.7 AUTOMATIC DRAIN VALVES

A. Provide automatic drain valves. The valve shall open when pressure in line decreases to 9 psi and seal again when pressure increases to 10 psi. Provide valves with screens on both inlet and outlet. Drain valves to be installed only on laterals of nominal pipe size 1-1/2 inch or less. Install valves at low points and at 100 feet on center in the laterals.

2.8 BACKFLOW PREVENTER

****
Construction drawings to include a detail of the backflow preventer per Mechanical Standard Drawing ST-D20GEN-1 (Formerly ST 6100).
****

A. Furnished and installed by the Contractor.

2.9 VALVE BOX

A. Provide plastic valve boxes for single valves with plastic locking cover.

2.10 GRAVEL DRAIN BACKFILL

A. Cleaned gravel or crushed stone, graded from 3/4 inch minimum to 1-1/2 inch maximum.

2.11 WIRING MATERIALS

A. Provide UL-approved wire for direct burial, type UF. Minimum gauge No. 14 AWG. Control wire must be insulated, single stand copper designed for 24 to 50 volts and copper conductor must meet or exceed ASTM B-3 specifications.

B. Make electrical wire splices water-tight using an approved sealing material.

2.12 AUTOMATIC CONTROL SYSTEM

A. Furnish low voltage system manufactured expressly for control of automatic circuit valves of underground sprinkler systems. Provide unit of capacity to suit number of circuits as indicated.

B. Provide manufacturer's standard control enclosure with locking cover, complying with NFPA 70 (National Electric Code). Provide weather proof enclosures at exterior locations.

C. Provide a transformer to convert site service voltage to control voltage of 24 volts. Provide dedicated breaker for controller at power panel connection.

D. Controller: Motorola MIR 5000C Field Unit, radio controlled.

2.13 BACKFILL MATERIAL

A. Backfill material will be subject to LANL approval. Provide backfill material free of rocks, large stones larger than 2 inches in any dimension, brush, sod, frozen material or other unsuitable substances to prevent damage to pipe during the backfill operations. When material from excavation or trenching is unsuitable for use as backfill it shall be disposed of, and suitable material which is capable of attaining the required relative density shall be furnished.

PART 3 EXECUTION

3.1 EXAMINATION

A. Carefully investigate the structural and finished conditions affecting the work, and plan work accordingly to furnish fittings and appurtenant items which may be required to meet field conditions. Install the work in the most direct and workmanlike manner so that conflicts between sprinkler installation, existing utilities, planting and other new and existing features will be avoided.

B. Notify the Construction Inspector 5 days prior to startup of construction to have LANL's support services subcontractor identify known underground utilities and stake and flag locations. If a conflict exists between the location of such obstacles and the proposed work, promptly notify the Construction Inspector and arrange for relocations. Proceed in the same manner if a rock layer or any other condition encountered underground makes changes advisable.

3.2 TRENCHING

A. Refer to Section 31 2000, Earth Moving.

B. Stake out all sprinkler head and valve locations. Prior to trenching, the stake-out will be reviewed by the Construction Inspector.

C. Excavate trenches straight and true with bottom uniformly sloped to low points. Make excavations of sufficient depth and width to permit proper handling and installation of the pipe and fittings. Clean trench of all soil, rocks, and debris before installing pipe and fittings.

D. Excavate trenches to a depth of 3 inches below invert of pipe, unless otherwise indicated.

E. Should the trenching extend through rocky soil, bed the piping in 2 inches of sand or approved backfill material and extend to a minimum of 2 inches over the top of pipe.

F. Provide 48 inch clearance between top of pipe and finish grade for pressure lines, and 12 inches for non-pressure lines, except where otherwise indicated on Drawings. When two or more pipes are to be placed in the same trench, maintain a minimum of one inch horizontal and vertical distance between the pipes.

G. Accurately trim trenches to provide a uniform bed, free from rocks, clods, or other sharp-edged objects.

H. Pitch piping to drains a minimum of 6 inches in each 100 feet. (0.5%).

I. Keep the bottom of the trench or excavation free and clear of water during the progress of the work.

J. Where existing pavement must be cut to install landscape irrigation system, cut smoothly to straight lines 6 inches wider than trench.

1. Remove cut out pavement and excavated material from the site.

2. Sleeve pipe and wiring under sidewalks, roadways, or parking lots in Schedule 80 PVC pipe. Size pipe sleeves 2 inches larger interior diameter than outside diameter of pipe being sleeved.

3. Repair or replace pavement cuts with equivalent materials and finishes as detailed on the Drawings.

3.3 INSTALLATION

A. Install materials and equipment in a neat and workmanlike manner in accordance with the recommendations of the manufacturers of the materials and ASTM D 2774.

****
Construction drawings to include water main tie-in details per Civil Standard Drawings ST-G3010-2 (Formerly ST6105).
****

B. LANL's support services subcontractor (SSS) will tie into the existing water main with materials furnished by the contractor.

C. Pipe:

1. Install plastic pipe in accordance with the manufacturer's recommended procedures. Carefully handle and store plastic pipe and fittings under cover to avoid damage. Do not use damaged or dented pipe.

2. Solvent weld plastic pipe and fittings using solvents and methods recommended by the manufacturer of the pipe. Make all connections between plastic pipe and metal valves or steel pipe with screw fittings using plastic female adapters with a nonhardening pipe dope applied to male threads. Make

screwed connections with light wrench pressure. Weld main lines under continuous pressure or pipes larger than 2-1/2 inches in diameter (nominal) with heavy duty gray PVC cement.

3. Apply cleaner and solvent in accordance with ASTM D 2855.

4. Do not lay pipe in water, or in trench when weather conditions are unsuitable for the work, except when otherwise expressly permitted.

5. After piping is installed, but before outlets are installed and backfilling commences, open valves and flush system with full head of water.

6. The full length of each section of pipe shall rest solidly upon the pipe bed, with recesses excavated to accommodate ells and joints. When work is not in progress, temporarily cap open ends of pipe and fittings. The system when completed shall be void of rocks, gravel, soil and other objects. To ensure a "clean" system, each joint of pipe shall be held in an upright position to allow foreign objects to fall out before the joint is added to the system. As each additional joint is being installed, steps will be taken to ensure that foreign objects do not enter the free end of the joint. At the end of a work period, cap open ends on installed pipe to keep out foreign matter.

7. Replace any section of pipe found to be defective before or after laying with sound pipe.

8. Minimum horizontal and vertical clearances between lines in the same trench shall be 4 inches. Main pressurized irrigation lines shall have a minimum soil cover of 48 inches, exclusive of mulch or paving. Laterals shall have a minimum soil cover of 12 inches, exclusive of mulch or paving.

D. Do not use saddle taps on irrigation lines. Make branches only with fittings and reducers. Use no bushings, street ells, or closed nipples, except where noted on the Drawings.

E. Provide sprinkler heads as specified and install to grade unless otherwise specified. Use teflon tape or teflon sealer on threaded connection at heads and joints. Install head in the vertical position, hand backfilled and compacted to near original density. Maintain a 24 inch clearance from wall, buildings or windows. Install heads adjacent to walks and curbs abutting the walk or curb edge with top of head to be 1/2 inch below top of walk or curb. Adjust irrigation heads to insure proper watering of plant material.

F. Install automatic drain valves on lateral lines only, at low points, 100 feet O.C. Install automatic drain valve 3 inches below top of gravel drain sump. Gravel drain sump shall be one cubic foot of washed gravel, with filter fabric completely surrounding gravel and automatic drain valve.

G. Install automatic and manual control valves and valve boxes in accordance with the recommendations of the manufacturer and as detailed in Drawings. Wire each valve to a separate station on the controller. Align valve boxes square with adjacent buildings or walks.

H. The controllers are located on the Drawings. Make power connections at the location noted. Mount and wire the controllers according to the manufacturer's approved procedures and as specified and shown. Connect controller to a

dedicated breaker on the power panel whenever possible.

I. Install control wire in same trenches as sprinkler main lines and laterals wherever practical. Snake the wires in the trench to allow for displacement of the wire during backfilling. Lay wires on the trench bottom on one side of the pipe only. If wiring is not in the same trench as piping, install in PVC minimum Class 160 piping and provide 12 inches minimum cover. Securely tape together valve wires running in the same trench at 10-foot intervals. Place the bundle of wiring to one side of piping (east of north/south lines and north of east/west lines) and no more than 3 inches from piping.

J. Keep wire splices to a minimum and if needed shall be made only in common splice boxes located in valve boxes. Provide a slack-wire loop at 100 feet intervals and at each valve with enough slack so that wire splices can be extended 24 inches above ground level to facilitate testing and trouble-shooting. Do not use wire size smaller than No. 14 AWG.

K. Install 115 Volt AC wiring in accordance with the requirements of the National Electrical Code. Service to controllers shall consist of one black and one white and one green wire in rigid conduit. Electric control lines from controller to automatic valves shall be a different color from the 115 volt service from the valves to the controller. Each wire from zone valves to controller shall be blue color for each station on the controller. Wire to master valve shall be red. The valve common wire shall be white. All electrically operated devices and all metal enclosures shall be connected to ground, as approved.

3.4 TESTING AND INSPECTION

A. Provide for inspection of the Work by LANL at any time. Maintain proper facilities and provide safe access for such inspection. Whenever testing or approval is required, provide notification 24 hours in advance where and when such work is in readiness for testing. Should work requiring testing or approval be backfilled prior to LANL approval, the Contractor, at the Contractor's expense, shall uncover, retest and restore the surface if directed by LANL.

B. Should any portion of the Work done or any materials delivered fail to comply with requirements of the Specifications or Drawings, such work or materials shall be rejected and shall be immediately removed from the site or corrected satisfactorily. Immediately remove materials which are rejected from the premises.

C. Pressure test PVC main lines piping after laying and completing joints and settings valves, but prior to backfilling. Pressure test as follows:

1. Center-load the pipe with a small amount of backfill to prevent arching or slipping under pressure. Flush out all lines, then cap all outlets and hydrostatically test the normally pressurized part of the system at a pressure of 150 psi as specified in the Uniform Plumbing Code. Test lines between master valves and remote control valves (where applicable) in the same manner at a pressure of 100 psi.

   Test laterals (intermittently pressurized) in the same manner at existing available static pressure. Leave joints exposed for inspection during the pressure test. Do not install swing joints or flexible nipples prior to pressure test. Maintain pressure tests on plastic pipe for not less than 4 hours. Do not use air pressure test.

2. If pressure loss occurs, affected line shall be repaired and tests shall be repeated until the entire system has been proven tight. Conceal lines passing hydrostatic pressure test the same day if nighttime temperatures are to be 32 degrees Fahrenheit and below. Install pressure gauges on the line being tested.

3.5 BACKFILLING

After pipe joints have been visually inspected and pressure testing has been accomplished and approved, backfilling may begin. Begin backfilling when the pipe is not in an expanded condition due to heat or pressure. Cooling of the pipe can be accomplished by operating the system for a short time before backfill or by backfilling in the early part of the morning before the heat of the day. Place backfill in horizontal layers not exceeding 8 inches in loose depth and thoroughly tamp and use water compaction by flooding trenches after each lift and allowing for settlement. Do not use water flooding of any of the trenches adjacent to walls, sidewalks, curbs or buildings. Backfill and compact these trenches by means of a mechanical compactor after each lift. Compact to original density of 85 percent in unpaved areas and 90 percent in paved areas of maximum density at optimum moisture per ASTM D1557 or AASHTO T180, whichever is greater, so that minimum settlement will result. Place backfill to the original ground level or to the limits designated on the plans and use topsoil to fill to finish grade.

3.6 COVERAGE AND ADJUSTMENT

When the sprinkler system is complete, perform a coverage test to determine if the water coverage for planting areas is complete and adequate and that spray does not hit buildings, walks and other locations where not required. Provide all materials and perform all labor necessary to correct any inadequacies of coverage, as directed by LANL. Upon completion of the installation of the system, adjust all heads and valves, and program controller to provide optimum sprinkler system performance.

3.7 MAINTENANCE

A. Maintain and adjust the irrigation system in coordination with the plant materials requirements until substantial completion. Irrigation maintenance shall include repair, replacement of parts or workmanship not operating properly and adjustment of timing and coverage of heads.

B. Prior to substantial completion acceptance of the project, furnish to LANL an irrigation operation and maintenance manual and review the manual and its contents with the Owner’s maintenance staff.

3.8 INSPECTION AND ACCEPTANCE

A. When work is completed, including maintenance, LANL will, upon request, make an inspection to determine acceptability.

B. Where inspected irrigation work does not comply with requirements, replace rejected work and continue specified maintenance until reinspected by LANL and found to be acceptable. Remove rejected equipment and materials promptly from project site.

END OF SECTION

****
Do not delete the following reference information:
****

FOR LANL USE ONLY

This project specification is based on LANL Master Specification 32 8400 Rev. 0, dated January 6, 2006.